Chapter 2 Changing Populations

A large chunk of space rock, called a meteorite, sped toward Planet Earth. Upon impact with the planet, it caused a fiery explosion comparable to thousands of nuclear warheads detonating. The meteorite's deep impact threw so much dust up into the air that the planet would be dark—sunlight would have a hard time reaching Earth's plants for years. What effect would this event have on the organisms living on Earth?

The fossil record suggests that such an event may have occurred at least once in Earth's history. The evidence suggests the environmental changes that resulted were so massive that mass extinctions occurred, eliminating most of Earth's species in a very short time. Why did some organism populations survive while others disappeared? How could life reclaim the devastated landscape and eventually transform it into vibrant and healthy ecosystems?

Mass extinction events are thought to be followed by a period of recovery in which the global ecosystems go through extensive changes. Again, the fossil record provides evidence that the mass extinction event that brought about the end of large dinosaurs was followed by an explosion of biodiversity with the rise of the mammals. If the fossil record provides evidence that life forms change over geological time, what process explains how these changes occur? Is this process of change at work today?

The collision of a massive meteorite with Earth is a large-scale event that affects the entire biosphere. Smaller-scale events that affect only local ecosystems occur on a daily basis. Examples include a piece of land being cleared of its vegetation and topsoil to make a gravel quarry or a massive forest fire destroying all vegetation in a forest. Because events like these are fairly common, scientists have been able to study how ecosystems respond when a significant number of life forms are removed or destroyed.

What patterns have been observed as ecosystems re-establish themselves in these circumstances? Are some observations from these small-scale events transferable to large-scale events? How do long time frames allow a different set of biological processes to occur?

By the end of Chapter 2 you will be able to describe the process of succession in a new or disturbed habitat, examine the factors affecting population numbers, and compare some observable adaptations demonstrated by a variety of organisms. You will also be able to outline the major concepts of the theory of evolution. Throughout the chapter you will be asked to examine the influence of humans on the environment and the role of people in species change and loss.

Try This Activity

Coloured Toothpicks

Imagine a species that lives on a small, grassy island. Members of this species are either yellow, red, green, or blue, and they inherit this colour from their parents. There is an equal number of each colour.

Your teacher, or a member of your class, will scatter an equal number of coloured toothpicks (or similar small, coloured items) in a grassy area or on a piece of green carpet. You will play the role of a predator introduced to the island and will feed by collecting toothpicks. Pick up as many toothpicks as you can of any colour. However, you have a limited time (one to two minutes) to feed before you must migrate to a warmer destination. Count the number of each colour of toothpicks collected during the time limit. Record them in a class data table.

Science Skills

✓ Performing and Recording

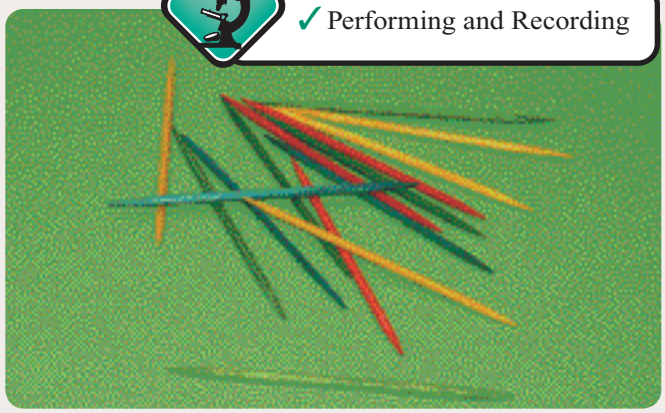

Figure D2.1: Coloured toothpicks play the part of an island's prey.

Discussion

1. In this activity, what do the collected toothpicks represent?
2. Describe predation effects on the prey population's size in both the immediate future and the long-term future.
3. Infer some reasons for differences in the numbers of prey (toothpicks) collected by the predators.
4. List members of the toothpick population that were least able to cope in the island ecosystem due to the predator's presence.
5. Describe characteristics of the toothpick population many generations after the predator has started visiting the island on its migration route.